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SOFT SKILLS REQUIRED BY COMPUTER EDUCATION STUDENTS FOR LEARNING COMPUTER HARDWARE MAINTENANCE IN UNIVERSITIES IN ENUGU STATE, NIGERIA

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Abstract
The study investigated soft skills required by computer education students for learning computer hardware maintenance in universities in Enugu State, Nigeria. The study had three specific purposes and three research questions. The study adopted a descriptive survey research design and was conducted in public universities in Enugu State. The population for the study was 200 undergraduate students (130 students from University of Nigeria, Nsukka, and 70 students from Enugu State University of Science and Technology) offering computer hardware maintenance in 2023/2024 academic session. The entire population was used due to the fact that the target group was small and of manageable size by the researchers. Data were collected using a structured questionnaire that was validated by three experts from the Department of Computer and Robotics Education, University of Nigeria, Nsukka. The reliability of the instrument was established using Cronbach Alpha reliability method which yielded reliability index of 0.72, indicating high reliability. The data was collected with the aid of two research assistants and were analyzed using mean to answer each of the three research questions, while standard deviation was used to determine the closeness or otherwise of the opinions of the respondents from the group mean. The null hypotheses were tested using independent sample t-test and analysis of variance at 0.05 levels of significance. The findings revealed that communication, teamwork, and problem-solving skills were crucial for diagnosing faults, collaborating in teams, managing multiple tasks, and ensuring effective troubleshooting. Based on the findings, it was recommended among others that national universities commission should integrate soft skills measurement into computer education curricula to enhance students' soft skills development.

Keywords: Soft skills; communication skills; teamwork skills; problem-solving skills; computer hardware maintenance

Introduction

Computer hardware maintenance is the repair activities carried out on a computer in order to ensure its operation is optimal. It is the practice of keeping computers in a good state of repair. Burns (2021) stated that computer hardware maintenance involves taking care of the computers physical components, (such as its keyboard, hard drive, etc.), in order to ensure smooth functioning of the computer system. The objectives of computer hardware maintenance is to aid students learn how to identify common symptoms and faults associated with computer malfunctioning; isolate the source of problem through basic troubleshooting techniques; and solve the problem (Eneovo & Olelewe, 2019). Hence, computer hardware maintenance ensures acquisition of skills.

Skill is the expertise, knowledge and capability to do something well especially through training. Skill is the enablement to execute a given task with pre-determined outcomes measure with energy dissipated and time taken or both (Samad, Vasodavan, Ojeniyi & Oyetade, 2017). Samad et al. (2017) further stated that skills are grouped into

generic skills (domain-general) and technical skills (domain specific). Technical skills according to Doyle (2021) are the abilities and knowledge needed to perform specific tasks. Technical skills in computer hardware maintenance according to Kipkem (2013) include: computer assembling; troubleshooting hardware and software problems; installing and configuring the peripherals components and drivers; software installation; wide knowledge of motherboard and circuit designs of monitor; and deep knowledge of printer and cartage refilling. Technical skills are basically referred to as hard skills. Computer hardware maintenance not only involves technical proficiency but also requires the development of generic skills.

Generic skills are basic knowledge that is expected to be acquired by educated people that include: self-motivation, time management, creativity, emotional mastery, flexibility, and teamwork. Doyle (2019) stated that generic skills are referred to as soft skills. Soft skills according to Pratt (2018) are personal traits that complement working context understandings and improve an individual's capacity to accomplish a given task. Kenton (2020) was of the view that soft skills are character traits and interpersonal skills that characterize a person's ability to interact effectively with others. In this context, soft skills are personality traits, abstract talents, and interpersonal skills, though intangible and unquantifiable, but crucial as well play vital roles in shaping students approaches for professional success. Soft skills enable individuals to work effectively with others, adapt to various workplace environments, and communicate ideas clearly, which are all critical in achieving professional and organizational goals. Soft skills are the basic and fundamental skill on which other skills thrive upon (Griffith & Nguyen in Mataka and Kowalske, 2015). Soft skills enable students not only to manage technical tasks, but also to collaborate effectively with peers, explain complex issues to non-technical users, and solve problems.

Problem-solving skill is the student's ability to resolve problems effectively without obstructions. Kaplan (2022) is of the view that problem-solving skills are ability to identify problems, brainstorm and analyse answers, and implement the best solutions. Furthermore, Tillery in Ngang, Nair and Prachak (2014) stated that problem solving skill is an effort to find solutions for difficult situations. It involves being able to identify and define the problem, generate alternative solutions, evaluate and select the best alternative, and implement the selected solution (Alonaizi, 2020). Students are expected to solve problems relating to computer hardware maintenance as they liaise with one another through effective communication.

Communication is soft skill that permits students to share ideas. Communication skills are the ability to convey ideas effectively verbally and nonverbal in various forms and contexts (Trilling and Fadel in Putri and Hidayat, 2019). Hutasoit (2021) opined that communication skills are the students' capabilities to speak, to write, to explain ideas and to create interactions and explorations of their ideas in classroom through group discussion. It is the ability to express opinions with clear sentences, convey commands clearly, and motivate others through speech. Students' communication skills are enhanced through teamwork. Teamwork is the cooperative effort of a group of students (using their individual skills) to complete a task with the intention of achieving a common goal. According to Keiling (2021), teamwork skills are the qualities and abilities that allow a student to work well with others during conversations, projects, meetings or other collaborations. Similarly, Ariella (2021) opined that teamwork skills refer to students' ability to work well with others, both in a one-on-one capacity and in a group setting.

Therefore, teamwork is a soft skill that allow permit encourage students to work together so as to achieve a common goal.

Unfortunately, most of the graduating students lack some of these soft skills that will enable them actually practice the trade or rather succeed in computer hardware maintenance business. This may be because lecturers don't pay attention on the students to develop these soft skills; or the overvaluing of technical competencies over the generic (soft) skills. According to Okoro (2019), many educational institutions prioritize technical training (in areas such as programming and system maintenance) but overlook the development of soft skills (like communication, teamwork, and problem-solving). Okafor (2021) noted that inadequate emphasis on soft skills impede students' overall development and readiness for the workforce. Hence, there is this need for a shift in the educational approach to include both technical and soft skills as integral components of the learning process.

Statement of the Problem

In the western world, soft skills are so crucial that they are ranked as the most important factor for potential job hiring (Robles, 2012). But in Nigeria, emphases are more on technical proficiency; little or nothing is done about soft skills. The role of soft skills cannot be overlooked. Without soft skills, students may find it challenging to navigate the technical demands effectively. All careers require soft skills to utilize technical expertise at the right time and place. That is, graduates need both technical skills and soft skills such as: communication skills, teamwork skills and problem solving skills, in other to get and keep a job in this 21st century. But, lecturers shy away from teaching soft skills simply because they are hard task (Cook, 2016); and cannot be easily verified with tests/examinations. Therefore, there is an urgent need to address this gap by identifying the soft skills required by Computer Education students for learning computer hardware maintenance in the Universities.

Purpose of the Study

The main purpose of the study was to investigate the soft skills required by computer education students for learning computer hardware maintenance in Universities in Enugu State, Nigeria. Specifically, the study sought to determine the:

1. Communication skills required by computer education students for learning computer hardware maintenance.
2. Teamwork skills required by computer education students for learning computer hardware maintenance.
3. Problem solving skills required by computer education students for learning computer hardware maintenance.

Research Questions

The following research questions were formulated that guided the research study:

1. What are the communication skills required by Computer Education students for learning Computer hardware maintenance?
2. What are the teamwork skills required by Computer Education students for learning Computer hardware maintenance?
3. What are the problem-solving skills required by Computer Education students for learning Computer hardware maintenance?

Hypotheses

The following null hypotheses were formulated to guide the study and were tested at 0.05 levels of significance.

$H0_1$: There is no statistical significant difference in the mean responses of male and female students on communication skills required by computer education students for learning computer hardware maintenance.

$H0_2$: There is no statistical significant difference in the mean responses of university students on teamwork skills required by computer education students for learning computer hardware maintenance.

$H0_3$: Age has no statistical significant difference on problem solving skills required by computer education students for learning computer hardware maintenance.

Methods

The study adopted descriptive survey research design and was carried out in public universities in Enugu State. The population for the study was 200 students (University of Nigeria Nsukka = 130, and Enugu State University of Science and Technology = 70) that took computer hardware maintenance in 2023/2024 academic session in Enugu State. Total population sampling technique was used due to the fact that the targeted group was small and of manageable size by the researchers. The instrument for data collection was a structured questionnaire titled "Soft Skills Required by Computer Hardware Maintenance Students Questionnaire (SSRCHMSQ)" developed by the researchers. SSRCHMSQ is a 15-item questionnaire that has a 5-point Likert scale with response option of Very Highly Required (VHR), Highly Required (HR), Neutral (N), Slightly Required (SR), and Not Required (NR) with value points of 5,4,3,2 and 1 respectively. The research instrument was face validated by three experts from the department of Computer and Robotics Education, University of Nigeria Nsukka. The reliability of the instrument was established using Cronbach Alpha reliability method. A total of 30 students from Nnamdi Azikiwe University, Awka, which was outside the study area but share similar geographical, socioeconomic, and educational characteristics were used for the trial testing. The reliability test yielded a coefficient of 0.72 that ascertained the internal consistency of the instrument. The researchers together with two (2) other research assistants who were properly briefed, administered the instrument to the respondents; and the consent of the respondents was voluntarily given. The data collected was analyzed using Mean to answer each of the three research questions; and Standard Deviation to determine the closeness or otherwise of the opinion of the respondents from the group mean. Any item with a mean value of 3.00 and above was regarded as "Required" while items below 3.00 was regarded as "Not required". Moreover, null hypotheses formulated for the study were tested at 0.05 levels of significance using independent sample t-test and Analysis of Variance. Thus, any t-value whose P-value level of significance is less than 0.05, the null hypothesis would be "rejected"; otherwise the null hypothesis would be "accepted".

Results

Research Question 1: What are the communication skills required by computer education students for learning computer hardware maintenance?

Table 1: Mean and Standard Deviation on communication skills required by computer education students for learning computer hardware maintenance.

S/N	Items	N	$\bar{X}$	SD	Decision
1	Ability to clearly explain hardware faults and maintenance issues verbally.	200	3.74	1.32	Required

2	Ability to communicate effectively using oral, written, and gesture forms during hardware maintenance.	200	3.52	1.33	Required
3	Ability to express hardware faults verbally to peers and supervisors.	200	3.54	1.30	Required
4	Ability to document and report hardware maintenance tasks effectively.	200	3.52	1.31	Required
5	Ability to use clear communication when troubleshooting hardware issues with non-technical users.	200	3.66	1.31	Required
	Cluster Mean	**200**	**3.60**	**1.31**	**Required**

Key: $\bar{X}$ = Mean, SD = Standard Deviation, N = Number of Respondents
Source: Researchers' Field Work, 2024

The data presented in table 1 showed that all the items had their mean values above the criterion mean of 3.00. This was an indication that communication skills were highly required by computer education students for learning computer hardware maintenance. Furthermore, the cluster mean of 3.60 confirmed the opinion of the respondents that communication skills were highly required by computer education students for learning computer hardware maintenance. The standard deviation of items 1 - 5 ranged from 1.30 - 1.33 indicated that the respondents were closely related to one another in their opinion from the group mean.

Research Question 2: What were the teamwork skills required by computer education students for learning computer hardware maintenance?

Table 2: Mean and Standard Deviation on teamwork skills required by computer education students for learning computer hardware maintenance

S/N	Item	N	$\bar{X}$	SD	Decision
6	Ability to collaborate effectively with peers during hardware maintenance activities.	200	3.65	1.30	Required
7	Ability to work in teams to solve complex hardware maintenance problems.	200	3.53	1.33	Required
8	Ability to share knowledge and resources effectively during group hardware maintenance tasks.	200	3.52	1.32	Required
9	Ability to contribute to the successful completion of group-based hardware maintenance projects.	200	3.53	1.31	Required
10	Ability to demonstrate leadership and cooperation in team hardware maintenance settings.	200	3.66	1.31	Required
	Cluster Details	**200**	**3.58**	**1.31**	**Required**

Key: $\bar{X}$ = Mean, SD = Standard Deviation, N = Number of Respondents
Source: Researchers' Field Work, 2024

The data represented in table 2 showed that all the items had their mean values above the criterion mean of 3.00. This was an indication that the majority of the respondents agreed that teamwork skills were required by computer education students for learning computer hardware maintenance. Furthermore, the cluster mean of 3.58 confirmed the opinion of the respondents that teamwork skills were required by computer education students for

learning computer hardware maintenance. The standard deviation of items 6 - 10 ranged from 1.30 - 1.33 indicated that the respondents were closely related to one another in their opinions from the group mean.

Research Question 3: What were the problem-solving skills required by computer education students for learning computer hardware maintenance?

Table 3: Mean and Standard Deviation on problem-solving skills required by Computer Education Students for learning Computer Hardware Maintenance

S/N	Item	N	$\bar{X}$	SD	Decision
11	Ability to troubleshoot and diagnose hardware faults effectively.	200	3.74	1.32	Required
12	Ability to apply critical thinking in solving hardware maintenance problems.	200	3.64	1.34	Required
13	Ability to develop creative solutions to unique hardware challenges.	200	3.52	1.33	Required
14	Ability to adapt quickly to new hardware technologies and their maintenance.	200	3.53	1.31	Required
15	Ability to solve complex hardware maintenance issues independently.	200	3.65	1.31	Required
	Cluster Details	**200**	**3.62**	**1.31**	**Required**

Key: $\bar{X}$= Mean, SD = Standard Deviation, N = Number of Respondents
Source: Researchers' Field Work, 2024

The data represented in table 3 showed that all the items had their mean values above the criterion mean 3.00. This indicated that majority of the respondents accepted that problem-solving skills were required by computer education students for learning computer hardware maintenance. Furthermore, the cluster mean of 3.62 affirmed that respondents agreed that problem-solving skills were required by computer education students for learning computer hardware maintenance. The standard deviation of items 11 - 15 ranged from 1.31 - 1.34 indicated that the respondents were closely related to one another in their opinion from the group mean.

Hypothesis 1: There is no significant difference in the mean responses of male and female students on communication skills required by computer education students for learning computer hardware maintenance.

Table 4: Independent Sample T-Test of male and female students on communication skills required by computer education students for learning computer hardware maintenance.

Gender	N	$\bar{X}$	SD	F	Sig.	T	df	Sig. (2-tailed)	Remark
Male	106	3.03	1.37	0.72	0.57	-0.08	198	0.63	**Not Significant**
Female	94	3.04	1.40						

Key: N=Number of Respondents, $\bar{X}$ =Mean, SD=Standard Deviation
Source: Researchers' Field Work, 2025

The result of the analysis in table 4 showed that Levene's of F(198) = 0.72, P = 0.57, t(198) = -0.08, P = 0.63 was not significant at 0.05 alpha level. This indicates that gender was not statistically significant on students' communication skills required by computer

education students for learning computer hardware maintenance. Hence, the null hypothesis was accepted.

Null Hypothesis 2: There is no statistical significant difference in the mean responses of university students on teamwork skills required by computer education students for learning computer hardware maintenance.

Table 5: Independent Sample T-Test of university students on teamwork skills required by computer education students for learning computer hardware maintenance

Gender	N	$\bar{X}$	SD	F	Sig.	T	df	Sig. (2-	Remark
UNN	130	2.91	1.40	1.04	0.50	-	198	0.62	**Not Significant**
ESUT	70	2.96	1.41			0.25			

Key: N=Number of Respondents, $\bar{X}$ =Mean, SD=Standard Deviation
Source: Researchers' Field Work, 2025

The result of the analysis in table 5 showed that Levene's of F(198) = 1.04, P = 0.50, t(198) = -0.25, P = 0.62 was not significant at 0.05 alpha level. This indicates that the university attended was not statistically significant on students' teamwork skills required by computer education students for learning computer hardware maintenance. Hence, the null hypothesis was accepted.

Hypothesis 3: Age has no statistical significant difference on problem solving skills required by computer education students for learning computer hardware maintenance.

Table 6: Analysis of Variance (ANOVA) of Age on problem solving skills required by computer education students for learning computer hardware maintenance

Source of variable	Sum of Squares	df	Mean Square	F	Sig.	Remark
Between	5.92	2	2.96	1.57	0.29	**Not Significant**
Within	362.24	197	1.84			
Total	368.16	199	4.80			

Source: Researchers' Field Work, 2025

The result of the analysis in Table 6 indicates that F (2, 197) = 1.57, p = 0.29 was not significant at 0.05 alpha level. This indicated that Age was no statistically significant on problem solving skills required by computer education students for learning computer hardware maintenance.

Discussion

The data presented in table 1 provided answers to research question one. The findings revealed that communication skills, such as: the ability to clearly explain hardware faults and maintenance issues, effectively communicate using oral and written forms, document hardware tasks, and troubleshoot hardware issues with non-technical users, were are highly required for effective learning of computer hardware maintenance. This aligns with Adeyemi (2020), who emphasized the importance of clear communication in diagnosing and resolving hardware issues. Furthermore, Okafor (2017) noted that the ability to communicate effectively enhances students' collaboration with peers and interaction with supervisors, ultimately improving their technical proficiency. Further analyses revealed that there was no statistically significant difference between the male and the female students on communication skills required by computer education students for learning computer hardware maintenance. The data presented in table 2 provided answers to

research question two. The findings showed that teamwork skills such as: ability to collaborate with peers, solve complex hardware problems in teams, share resources effectively, contribute to group projects, and demonstrate leadership in team settings, were essential for solving complex hardware maintenance problems and contributing to group projects. This finding supports Adewale (2018), who identified teamwork skills as a crucial element in technical education. Collaborative activities in computer hardware maintenance help students develop problem-solving skills and adaptability, as highlighted by Olowe and Ojo (2020). Further analyses revealed that there was no statistically significant difference between UNN and ESUT students on teamwork skills required by computer education students for learning computer hardware maintenance.

The data presented in table 3 provided answers to research question three. The findings revealed that the ability to diagnose and fix hardware issues, think critically, and apply innovative solutions, were key problem-solving skills required by students to learn computer hardware maintenance. The findings were in line with that of Nwafor (2016), which revealed observed that students with strong problem-solving abilities perform better in practical tasks, such as hardware troubleshooting. Further analyses revealed that age was not statistically significant on problem solving skills required by computer education students for learning computer hardware maintenance.

Conclusion

The study concluded that soft skills are essential for enhancing the overall competence of graduates, ensuring that the students are well-prepared to meet the demands of the modern technology workforce, and contribute effectively to their professional carrier. Integrating soft skills enhances not only interpersonal competencies but also improve technical performance by fostering better communication, teamwork, and problem-solving abilities. Hence, soft skills enhance graduates employability and effectiveness in the workplace.

Recommendations

The following recommendations were made based on the findings of the study and implications:

1. The study should be replicated in other computer education courses in other universities across Nigeria.
2. National Universities Commission should integrate soft skills measurement into computer education curricula to enhance students' soft skills development.
3. Lecturers should be trained on how to measure soft skills using assessment (rubrics), behavioural interview, and simulation in other to improve students learning outcome.
4. National Universities Commission should mandate the inclusion of soft skills modules in all her curricula to ensure that Bloom's taxonomy of educational objectives (cognitive, affective and psychomotor domain) were taught and measured in every academic discipline.

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